



# Space Science

*Marshall Space Flight Center CDDF Success Story Number 5*

## **High Precision Remote Sensing Technologies For Space Applications**

The Marshall Space Flight Center, in collaboration with Oak Ridge National Laboratories, the University of Alabama in Huntsville, and the University of Tennessee, is advancing the state of the art in remote distance sensing and remote temperature measuring. This research is being funded by the NASA/MSFC Center Director's Discretionary Fund.

In the area of remote separation sensing, this research has achieved notable success in developing an optical approach for determining distances to optical precision. In space telescopes for example, precise distance knowledge is vital to correctly focusing instruments. This approach could provide, without physically touching the mirror, the separation distribution as a function of time of the secondary and primary mirrors. The basic physical principle that enables this idea is that the Fresnel pattern reflected from a target surface is highly dependent upon the separation of the observing system from the reflecting surface. Mapping this pattern at various distance allows an extraordinarily determination of the separation.

In the area of remote temperature sensing, phosphor materials may be attached to a target body. A laser is then used to cause the phosphor to fluoresce. The decay of the stimulated emission is strongly dependent on the temperature. Hence, without physically touching or intrusively measuring with probes one may determine to high precision the temperature of a substance. Again, the temperature distribution of a large aperture in space could be accurately mapped for adaptive optical correction. This research is proving to be highly